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| APPLICATION NO. | FILING DATE | FIRST NAMED INVENTOR | ATTORNEY DOCKET NO. | CONFIRMATION NO. |
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| 09/260,478 | 03/01/1999 | IONEL JITARU | | 6598 |

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[REDACTED] EXAMINER

LAXTON, GARY L

[REDACTED] ART UNIT [REDACTED] PAPER NUMBER

2838

DATE MAILED: 04/11/2003

27

Please find below and/or attached an Office communication concerning this application or proceeding.

| | | |
|------------------------------|-----------------|---------------|
| Office Action Summary | Application No. | Applicant(s) |
| | 09/260,478 | TITARU, IONEL |
| | Examiner | Art Unit |
| | Gary L. Laxton | 2838 |

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --
Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
- Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1) Responsive to communication(s) filed on 06 March 2003.

2a) This action is FINAL. 2b) This action is non-final.

3) Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4) Claim(s) 1-46 is/are pending in the application.

4a) Of the above claim(s) 8-35 is/are withdrawn from consideration.

5) Claim(s) _____ is/are allowed.

6) Claim(s) 1-7, 36-46 is/are rejected.

7) Claim(s) _____ is/are objected to.

8) Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9) The specification is objected to by the Examiner.

10) The drawing(s) filed on _____ is/are: a) accepted or b) objected to by the Examiner.
 Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

11) The proposed drawing correction filed on _____ is: a) approved b) disapproved by the Examiner.
 If approved, corrected drawings are required in reply to this Office action.

12) The oath or declaration is objected to by the Examiner.

Priority under 35 U.S.C. §§ 119 and 120

13) Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a) All b) Some * c) None of:

1. Certified copies of the priority documents have been received.
2. Certified copies of the priority documents have been received in Application No. _____.
3. Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

14) Acknowledgment is made of a claim for domestic priority under 35 U.S.C. § 119(e) (to a provisional application).
 a) The translation of the foreign language provisional application has been received.

15) Acknowledgment is made of a claim for domestic priority under 35 U.S.C. §§ 120 and/or 121.

Attachment(s)

1) Notice of References Cited (PTO-892) 4) Interview Summary (PTO-413) Paper No(s). _____ .
 2) Notice of Draftsperson's Patent Drawing Review (PTO-948) 5) Notice of Informal Patent Application (PTO-152)
 3) Information Disclosure Statement(s) (PTO-1449) Paper No(s) _____. 6) Other: _____

DETAILED ACTION

Response to Amendment

1. Claims 36-46 were inadvertently not addressed in the last office action dated 04/04/02; therefore, the finality of the rejection of the last Office action is withdrawn

Response to Arguments

2. Applicant's arguments with respect to claims 1-7 have been considered but are moot in view of the new ground(s) of rejection necessitated by amendment.

Claim Objections

3. The numbering of claims is not in accordance with 37 CFR 1.126 which requires the original numbering of the claims to be preserved throughout the prosecution. When claims are canceled, the remaining claims must not be renumbered. When new claims are presented, they must be numbered consecutively beginning with the number next following the highest numbered claims previously presented (whether entered or not). Misnumbered claims 8-18 have been renumbered 36-46.

Claim Rejections - 35 USC § 103

4. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the

invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

5. Claims 1, 4-6, 36 and 39-42 are rejected under 35 U.S.C. 103(a) as being unpatentable over Okamoto et al in combination with Morris.

[claims 1 and 4-6] Okamoto et al disclose an AC source of power (V_{AC}), a rectifier (3) as claimed and an inductor (21) connected between the AC source (V_{AC}) and an input terminal to the rectifier (3).

However, Okamoto et al do not disclose the AC power source as having a dead time.

Morris teaches a magnetically integrated full wave DC to DC converter; especially in FIG. 13 wherein there is illustrated an embodiment employing a primary side full-bridge inverter (SW1-SW4) where zero voltage switching is implemented by short circuiting the primary during dead times in order to provide an efficient converter circuit (col. 1 lines 15-20; col. 2 lines 12-16, lines 20-25, lines 29-32, lines 40-45; col. 3 lines 35-60; col. 4; col. 10 lines 15-30, lines 45-50; see also pertinent art reference Steigerwald et al col. 9 lines 59-61).

Therefore, providing efficient converter circuits to produce a well regulated DC voltage free from shoot through fault and which enjoy distinct advantages of zero voltage switching techniques is highly desirable; and it would have been obvious to one having ordinary skill in the art at the time the invention was made given the circuit of Okamoto et al in combination with the teachings of Morris to provide an AC power source that includes dead time in order to provide a an efficient soft switching circuit which would produce an efficient and well regulated DC voltage free from shoot through fault and which enjoys distinct advantages of zero voltage switching techniques as taught by Morris.

[claims 36, 39-41, 43] Morris also discloses the source being a transformer (T) having a primary winding (P), a secondary winding (S1, S2) which would be connected to the inductor (21) of Okamoto et al, and a switching circuit (SW1-SW4) for shorting the primary winding during the dead time to provide zero impedance (col. 26 lines 25-30).

[claims 44 and 46] Morris discloses continuous current conduction through to the load, however, if the dead time is extended current to the load and thus through the inductor of Okamoto et al would be reduced to zero. Therefore, it would have been obvious to one having ordinary skill in the art at the time the invention was made to allow the current in the inductor to go to zero in order to operate the converter in discontinuous mode in order to reduce losses and noise that may be generated as is well known in the art.

[claim 45] Morris discloses continuous current conduction through to the load.

6. Claims 2, 3, 37 and 38 are rejected under 35 U.S.C. 103(a) as being unpatentable over Okamoto et al in combination with Morris in combination with Jacobs et al.

Okamoto et al in combination with Morris teach the claimed subject matter with regards to claim 1 except for replacing the diodes of the rectifier with synchronous rectifiers.

It is all to well known in the art that especially with the increasing requirement in applications such as computers where there is demand for power supplies with even lower supply voltage, the conduction loss in the diode output rectifier becomes the biggest source of power loss in switching power supplies. Even the commonly used Schottky diodes have a relatively large voltage drop and, hence, a large power loss in such low-output-voltage applications.

Consequently, low-voltage metal-oxide-semiconductor field-effect transistors which operates in the third quadrant, with a very low on-state resistance and fast switching speed can be used to replace the diodes in the output stage. The conduction loss can therefore be reduced to a very low value by paralleling more MOSFETs. The SR is also fast because it is a majority carrier device. Jacobs et al in Col.1 lines 20+ and Col. 9 lines 30+ teaches substituting diodes and synchronous rectifiers.

Therefore, it would have been obvious to one having ordinary skill in the art at the time the invention was made to utilize synchronous rectifiers in place of the diodes in order to reduce conduction losses as is well known in the art that synchronous rectifiers provide.

[claims 37 and 38] Morris also discloses the source being a transformer (T) having a primary winding (P), a secondary winding (S1, S2) which would be connected to the inductor (21) of Okamoto et al, and a switching circuit (SW1-SW4) for shorting the primary winding during the dead time to provide zero impedance (col. 26 lines 25-30).

7. Claims 7 and 42 are rejected under 35 U.S.C. 103(a) as being unpatentable over Okamoto et al in combination with Morris further in combination with Trousdale and still further in combination with Schutten et al.

Okamoto et al in combination with Morris disclose the claimed invention as stated above in regards to claim 1 except for connecting a switch between the input terminals of the rectifier circuit and the switch being bi-directional.

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Trousdale teaches that it is known in the art to connect a switch between the inputs of a rectifier circuit. However, the combination of Okamoto et al and Morris and further in combination with Trousdale do not teach the switch being bi-directional.

Schutten et al teaches that it is known in the art to connect a bi-directional switch between terminals of a rectifier circuit. Therefore, it would have been obvious to one having ordinary skill in the art at the time the invention was made to connect a switch between the input terminals of a rectifier circuit to provide a new and improved electronic switch which may serve as a pulsing relay in applications where the controlled circuit may be of either polarity and where no direct current flow is permissible between the controlled circuit and the pulsing relay driving circuit as taught by Trousdale and to further make the switch bi-directional as taught by Schutten et al for shaping voltage or current waveforms.

[claim 42] Morris also discloses the source being a transformer (T) having a primary winding (P), a secondary winding (S1, S2) which would be connected to the inductor (21) of Okamoto et al, and a switching circuit (SW1-SW4) for shorting the primary winding during the dead time to provide zero impedance (col. 26 lines 25-30).

Conclusion

8. The prior art made of record and not relied upon is considered pertinent to applicant's disclosure.

US 4,864,479 Steigerwald et al: full bridge lossless switching converter see esp. col. 9 lines 59-61.

US 5,963,436 Yoshida: switching power supply apparatus see esp. col. 6 lines 1-5.

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9. Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

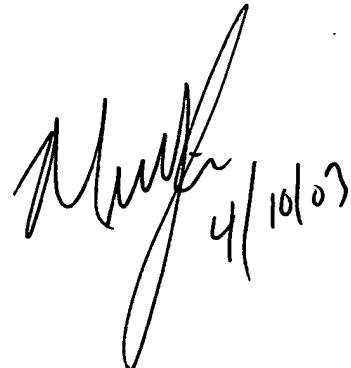
A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

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10. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Gary L. Laxton whose telephone number is (703) 305-7039. The examiner can normally be reached on Monday thru Thursday.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Michael Sherry can be reached on (703)308-1680. The fax phone numbers for the organization where this application or proceeding is assigned are (703) 305-7724 for regular communications and (703) 308-7722 for After Final communications.

Any inquiry of a general nature or relating to the status of this application or proceeding should be directed to the receptionist whose telephone number is (703) 308-0956.



A handwritten signature in black ink, appearing to read "Gary L. Laxton". To the right of the signature is the date "4/10/03" written vertically.

GLL
April 10, 2003